

Capsule with piercable cap, stopper equipped with such a capsule containing a substance for adding to the contents of a receptacle thus closed and the corresponding receptacle

5 The present invention relates to a capsule for fitting in a stopper for a receptacle with a neck or collar designed to dispense liquids or pastes, particularly for mineral water bottles and the corresponding stopper and receptacle.

 More precisely, the stopper equipped with a capsule according to the present invention is provided to contain, in a hermetically isolated compartment of the receptacle
10 thus closed, a substance or special composition designed to be mixed with the contents of said receptacle just before use or consumption thereof.

 The stopper of the present invention may in particular be used to close bottles made of synthetic materials generally known as plastics materials (for example PET) designed to contain all sorts of more or less fluid food or non-food liquids, such as, for example,
15 mineral water, fruit juice, milky drinks, etc. but also sauces or condiments (ketchup, mustard, vinaigrette, etc.) or non-food liquids (cleaning products, detergents, etc.).

 In this particular field, a fair number of stoppers are already known with compartments enclosing a substance, particularly a food substance, to be added to the contents of the receptacle that generally contains a drink such as water or milk, for example
20 for preparing energy-giving drinks or feeding bottles.

 However, all the current stoppers have a certain number of more or less inconvenient drawbacks.

 A first type from among these known stoppers has a capsule or reservoir sealed by a membrane or detachable tongue and fixed on the upper part of said stopper equipping a
25 receptacle. To add the substance contained in the reservoir to said receptacle, it is necessary to unscrew the stopper, pull back the membrane or tongue closing said reservoir in order to create an opening for said substance, to turn over the stopper to pour said substance into said receptacle and finally, to rescrew the stopper on said receptacle to be able to shake it and thus mix the substance with the contents thereof. The use of this type of stopper
30 therefore requires numerous tiresome stages, of which certain, such as that consisting of turning over the stopper to release the substance into said receptacle, may demand a certain dexterity to avoid pouring the substance over the sides thereof.

Another type of stopper has a capsule or reservoir releasing a solid substance in the form of a tablet by means of pressure applied by the finger of the user on said capsule. But, this type of stopper has sealing problems, as it will be recalled that the contents of the receptacle must not accidentally come into contact with the substance enclosed in the capsule. These problems are resolved in this type of stopper by the presence of a sealing cap fixed on the neck of the receptacle. In a first variant embodiment of this stopper, to release the substance, the user first unscrews the stopper to remove the cap, then replaces the stopper on the receptacle and releases the tablet of the capsule by pressing thereon. In a second variant, the user may remove the cap, while the stopper is fixed on the receptacle. In both cases, numerous tiresome stages are again necessary to release the substance. Moreover, another drawback resides in the fact that the cap of the capsule that allows the substance to be released only functions well when this substance is in the form of tablets or rigid pastilles.

To limit the number of stages needed to release the substance, a type of stopper has been designed in which the substance, in the form of a tablet or rigid pastille, is contained between an upper deformable membrane to which pressure is applied to release said substance, and a lower cap serving as a sealing element. The lower cap is torn by the tablet when the user applies pressure to the upper membrane.

Now, the rigidity of the cap is a critical parameter in that it must be both low enough to allow the easy release of the substance (preferably whatever its state) and high enough to allow said cap to resist pressure that may be applied thereto by the contents of the receptacle when it is compressed during the handling phases of the receptacle. In fact, when the cap is too weak, breakages occur to it during the handling phases, and the substance is mixed accidentally with the contents of the receptacle.

When the cap is fairly rigid, the pressure that must be applied by the user or consumer on the cap to release the substance must also be high, which can be disadvantageous for certain people. Ideally, the pressure transmitted to the cap by means of the substance should be identical, whatever the form or structure of the substance. But, when using a substance in powder form, for example, the force applied to the elastic membrane is reduced when transmitted to the cap and is not always enough to tear the membrane in order to release the substance.

The main disadvantage of this type of stopper is therefore that it is limited to the use of substances in the form of tablets or rigid pastilles which are the only ones capable of substantially completely transmitting the force applied by the finger to the cap. This type of stopper cannot be applied therefore in the case of substances that are liquid or in powder
5 form. In addition, the breakage of the cap is a function of the form of the substance, which excludes any reproducibility of said breakage.

The present invention aims to overcome at least some of the drawbacks of known capsules and stoppers with capsules and to provide a capsule and stopper that minimise the risk of accidental breakage of the cap allowing isolation of the substance contained in the
10 receptacle to which it must be added and that allow easier clean and reproducible breakage of said cap by the user which is as independent as possible of the state or physical structure of said substance.

In fact, ideally it should be possible to break the sealed cap whatever the type of substance that is to be added to the contents of the receptacle, particularly in the case of
15 partially filled capsules containing substances that do not always allow transmission of enough of the mechanical force applied by the user to break the sealing cap.

This may be the case particularly for very fluid liquids, very deformable or compressible solids such as fine powders, very crumbly granules, etc.

In addition, it must be possible to use the stopper according to the invention with
20 little force and few manipulations by one hand of the consumer, and the opening should not preferably cause the formation of detached pieces.

The present invention therefore relates to a sealed capsule basically consisting of a deformable membrane sealed at its base by a piercable cap so as to define a sealed volume for containing at least one substance between said deformable membrane and said cap,
25 characterised in that it has at least one integrated breakage means for said piercable cap capable of tearing it to release an effective quantity of the substance(s) following sufficient deformation of said deformable membrane due to an external mechanical force applied thereto.

It also relates to a stopper for a receptacle with a neck or collar designed to dispense
30 liquids or pastes, in particular for a mineral water bottle, characterised in that it basically consists of a base plate for fixing on said receptacle and closing said receptacle by means of a capsule according to the invention added in a sealed manner on said base plate, the

deformable membrane of said capsule being itself covered by a rigid protective cover resting on an annular base part added on said base plate, the lower base of said capsule being formed by the piercable cap, a useful sealed volume filled with at least one substance for adding to the contents of the receptacle before consumption being thus defined between
5 the deformable membrane and said cap of said capsule, an effective quantity of the substance(s) being released into the contents of the receptacle when the cap breaks due to sufficient deformation of the deformable membrane.

It also relates to a receptacle with a neck or collar for distributing liquids or pastes, particularly mineral water, characterised in that it comprises a capsule according to the
10 present invention.

Other characteristics and advantages of the invention will appear from the description that follows, given as an example and with reference to the accompanying drawings in which:

Fig. 1 is a diagrammatic side view in section of a first embodiment of the capsule
15 according to the invention before use;

Fig. 2 is a diagrammatic view from beneath of the capsule of figure 1;

Fig. 3 is a diagrammatic side view in section of a second embodiment of the capsule according to the invention before use;

Fig. 4 is a diagrammatic view in section along A-A of the capsule of figure 3;

20 Fig. 5 is a diagrammatic side view in section of a third embodiment of the capsule according to the invention;

Fig. 6 is a diagrammatic view in section along A-A of the capsule of figure 5;

Fig. 7 is a diagrammatic view in section along B-B of the capsule of figure 6 in the used state:

25 Fig. 8 is a diagrammatic view in section of a fourth embodiment of the capsule according to the invention;

Fig. 9 is a diagrammatic view in section of a fifth embodiment of the capsule according to the invention before use;

Fig. 10 is a diagrammatic side view in section of a sixth embodiment of the capsule
30 according to the invention before use;

Fig. 11 is a diagrammatic view in section along A-A of the capsule of figure 10;

Fig. 12 is a diagrammatic view in section along B-B of the capsule of figures. 10 and 11;

Fig. 13 is a diagrammatic view in section along B-B of the capsule of figure 10 in the used state;

5 Fig. 14 is a diagrammatic side view in section of a seventh embodiment of the capsule according to the invention before use;

Fig. 15 is a diagrammatic view in section along A-A of the capsule of figure 14;

Fig. 16 is a diagrammatic view in section along B-B of the capsule of figures. 14 and 15;

10 Fig. 17 is a diagrammatic view in section of the capsule of figure 14 in the used state;

Fig. 18 is a side view in section of a stopper according to the invention in the closed state equipped with a capsule according to the first embodiment of figure 1 before use;

15 Fig. 19 is a view of the stopper of figure 18 fitted on a receptacle, after opening the protective cover and breaking the cap of the capsule;

Fig. 20 is a side view in section of a stopper according to the invention in the closed state equipped with a capsule according to the third embodiment of figures. 5 to 7;

Fig. 21 is a view of the stopper of figure 18 fitted on a receptacle, after opening the protective cover and breaking the cap of the capsule;

20 Fig. 22 is a side view in exploded section of a stopper according to the invention in the closed state equipped with a stopper according to an eighth embodiment before assembly;

Fig. 23 is a diagrammatic side illustration in partially exploded section of a stopper according to the invention in the closed state equipped with a protective cover produced according to a variant embodiment of the invention, before assembly;

Fig. 24 is an illustration of the view of figure 23, after assembly;

Fig. 25 is a view in perspective of the protective cover of figures. 23 and 24;

Fig. 26 is a diagrammatic view in perspective of a particular embodiment of a constituent element of the stopper according to the invention;

30 Fig. 27 is a view in section along A-A of the element of figure 26;

Fig. 28 is a view from above of the element of figure 26 and,

Fig. 29 is a partially enlarged view in perspective of the central portion of figure 26.

Reference will be made initially to figure 1 which shows a diagrammatic side view in section of a first embodiment of the capsule according to the invention. In the embodiment described and illustrated, the sealed capsule 1 basically consisting of a deformable membrane 2 sealed at its base by a piercable cap 3 so as to define a sealed volume V designed to contain at least one substance S between said deformable membrane 2 and said cap 3 is characterised in that it has at least one integral breakage means 4 for said piercable cap 3 capable of tearing it to release an effective quantity of the substance(s) S following sufficient deformation of said deformable membrane 2 due to external mechanical force applied thereon.

The incorporation actually within said capsule 1 of the breakage means 4 allows a one-piece capsule 1 to be manufactured ready to be fitted in the stopper selected to close the desired receptacle which does not require the provision of an additional external element to break the cap 3.

According to a first particularly simple and economical embodiment, the capsule 1 according to the present invention is characterised in that the breakage means 4 is produced in the form of a pre-cut-out 5 of the cap 3, namely at least one preferred point or line of breakage thereof.

Advantageously, the pre-cut-out 5 is produced in the form of a set of preferred breakage lines arranged in the form of a star, preferably centred on said cap 3.

In this way, opening by tearing of the cap 3 is guaranteed and it is as easy and reproducible as possible.

Another example of a pre-cut-out 5 in the form of a cross has been illustrated as an indication in figure 2, but other geometries may also be suitable.

The pre-cut-out 5 as such may be produced by any generally used process, known in itself, particularly by laser cut-out, die-stamping, etc.

Preferably, the deformable membrane 2 is produced from PVC, a resilient material that allows the user to deform it sufficiently, for example with a finger, to succeed in breaking the cap 3 and thus releasing the substance(s) S into the contents of the receptacle R. The deformable membrane 2 itself may take any form although a global shape such as a bell-shape, preferably a bell of which the highest point is flat, for example disk- or oval-shaped, etc. may be preferred.

According to another non-illustrated characteristic, the deformable membrane 2 may comprise at least one preferential deformation means thereof produced in the form of a point, line or surface of preferential deformation, for example, in the form of a recess in the form of a groove portion of substantially semi-cylindrical section situated on the side of said deformable membrane 2. This means allows a point, line or surface to be created initiating and facilitating the deformation of the rest of the deformable membrane 2 to achieve the desired objective, namely a concentration of force leading to a sufficiently marked deformation of said deformable membrane 2 which allows tearing or sufficient breakage of the cap 3 to allow the passage of the substance(s) S contained in the sealed volume V for adding to the contents of the receptacle equipped with the capsule 1 according to the invention.

In the above-mentioned preferred example, the thumb or finger of the user pressing first on the deformable membrane 2 at the place where the preferred deformation means (which are situated in a place that is easy for the consumer to access, for example in a region close to the highest point) are situated, initiates a relatively easier deformation of the deformable membrane 2 which is propagated over the remaining, more rigid, surfaces drawing them into the deformation movement which rapidly becomes extensive enough to lead to a significant passage opening for the substance(s) S in the piercable cap 3.

If the deformable membrane 2 is produced from a flexible or elastic material, such as natural rubber, said membrane may be restored to its initial form when the pressure applied by the finger of the user stops, thus retaining the original aesthetic appearance of the stopper.

Of course, other deformable materials fulfilling the same function may also be suitable, although PVC is preferred, in particular because of its physical and chemical properties which are particularly suited to the use described.

It goes without saying that the material(s) used to produce the capsule 1, the stopper and more particularly that or those used to produce the deformable membrane 2 and the cap 3 must be chemically and physically compatible with the nature of the liquid or paste contents of the receptacle R thus closed, respectively with the substance(s) S contained in the sealed volume V delimited by said deformable membrane 2 and said cap 3. Moreover, if the receptacle R closed by the stopper according to the invention is designed to contain an edible liquid or paste, it should also be ensured that the aforementioned materials are indeed

of food quality and that the stoppered product marketed does indeed meet the applicable health regulations.

Thus, a single operation after opening the protective cover 19 (cf. for example figures 18 and 19) is sufficient to transfer the substance(s) S into the receptacle R.

5 The operation to open said protective cover 19 may also be performed with only one hand, for example, by seizing the receptacle R in the palm and releasing said protective cover 19 by the action of the thumb of the same hand. figure 19 illustrates a stopper equipped with a capsule of the type of that of figure 1 when the protective cover 19 has been opened, the deformable membrane 2 pushed in sufficiently for the cap 3 to be torn, the
10 substance(s) S then falling into said receptacle R.

To close it, the index finger replaces the protective cover on the base part 20 until it "clicks" closed.

The structure of the base part 20 and the opening and closing means 33, 34 will be detailed later.

15 According to another characteristic, the capsule 1 according to the invention is characterised in that it comprises at least one intermediate part 6 provided between said deformable membrane 2 and said cap 3, said intermediate part 6 having at least one breakage means 4 of said deformable membrane 2 which can be activated when said sufficient deformation thereof occurs.

20 As illustrated, for example in figures 3 and 4, a capsule 1 according to the invention produced in accordance with a second embodiment is characterised in that said at least one intermediate part 6 is produced in the form of a ring 7 arranged between the deformable membrane 2, preferably substantially bell-shaped and more preferably of which the highest point is flattened, and the cap 3 sealing said volume V, said ring 7 having, as a breakage
25 means 4, at least one surface portion 8 delimited in said ring 7 so that it forms a hinged flap in relation to said ring 7, said flap being suitable to pivot towards the cap 3 with a view to piercing it when said deformable membrane 2 is sufficiently deformed.

 According to a third embodiment illustrated in figures 5 to 7, the capsule 1 according to the invention may be characterised in that said at least one intermediate part 6
30 is produced in the form of a ring 7 arranged between the deformable membrane 2, preferably substantially produced in the form of a bell and more preferably of which the highest point is flattened, and the cap 3 sealing said volume V, said ring 7 having, as a

breakage means 4, several surface portions 8, 8', preferably connected to each other by at least one breakage bridge 10 and delimited in said ring 7 so as to form, for each surface portion 8, 8', a hinged flap in relation to said ring 7, each flap being suitable to pivot, after breakage of the bridge(s) 10 connecting them, towards the cap 3 in order to pierce it when
5 said deformable membrane 2 is sufficiently deformed.

As can be seen in figures 10, 11, 14, 15, 22, 23 and 24, the end of the breakage means 4 opposite the hinge 9 of the pivoting flap formed or the tie of said breakage means 4 on the intermediate part 6 may be equipped with a slender tie or bridge 10' performing the function of a breakage bridge that secures said means 4 while the stopper is not effectively
10 being used. This bridge 10' also requires the user, if he wishes to tear the cap 3, to apply fairly strong pressure or force on the arched element 15 sufficient to break said bridge 10' and which, at the same time and because of its great intensity and sudden application, allows a sharper or cleaner breakage or cutting of the cap 3, compared to a progressive breakage by applying force that increases as required, thus releasing all the substance S
15 contained in the capsule 1.

This is the case if the deformable membrane 2 has not been deformed (pushed in) enough to transmit the mechanical force either by coming into contact itself or by transmitting the pressure via the substance S to the cap 3 or to the surface of a support 14 as illustrated in figure 10 and described in more detail below, and if the force thus transmitted
20 is not sufficient to break this bridge 10' or a bridge 10 that connects two surface portions to each other (cf. figures 6 and 9), a comparatively smaller force than that needed to pierce the cap 3.

Advantageously, said ring 7 and said surface portions 8, 8' are produced by injection-moulding of a synthetic material, preferably polyethylene, in the region of or in
25 immediate proximity to the breakage bridge(s) 10, 10'.

As can be seen in the embodiments of figures 8 and 9, the capsule 1 according to the invention is further characterised in that at least one part of the free contour of said surface portions 8, 8' has one or more sharp-angled parts 11, of the tooth type, facilitating piercing
of the cap 3.

This makes it easier, if necessary, to break said cap 3 which must otherwise be torn without being assisted. The form of the pivoting flap and/or breakage means 4 and the number thereof is determined according to the tear resistance procured by the cap 3 which

is generally produced in the form of a thin aluminium foil that may be plasticised or similar.

Projecting teeth for the breakage means have been illustrated as a non-limiting example but other projecting and cutting geometries are also possible, for example in the
5 form of vertical protruding and projecting points or in the thickness of said pivoting flap directed towards the cap 3.

According to the variant embodiment illustrated in figures 14 to 17, the breakage means 4 has at least one substantially vertical projecting element 12 directed towards the cap 3 facilitating piercing thereof. This variant will be described in more detail later.

10 A sixth variant of the capsule 1 according to the invention is characterised in that the surface portion(s) 8, 8' of the breakage means 4 have a rigid element 13, protruding in the direction of the deformable membrane 1 and with a global useful support surface 14 capable of transmitting an external mechanical force applied to said deformable membrane 2 by the user which is sufficient to cause at least one surface portion 8, 8' to pivot and the
15 cap 3 to break releasing an effective quantity of the substance(s) S into the contents of the receptacle R on which said capsule 1 will be fitted.

A non-limiting example corresponding to this type of variant is illustrated in figures 10 to 13.

To facilitate the transfer of energy needed to break the cap 3, the capsule 1 is
20 preferably characterised in that the rigid element 13 has a useful support surface 14 taking on the form, at least on one portion, substantially of said deformable membrane 2, preferably the form of the highest point or of a portion of the highest point thereof.

In an even more preferred manner, the rigid element 13 is produced in the form of a vertical or substantially vertical semi-cylindrical portion of semi-circular section, the useful
25 support surface 14 being then in the form of a rectangular or substantially rectangular band, as illustrated in figures 10 to 13 of the sixth embodiment given as an indication.

This configuration allows the user to deform the deformable membrane 2 to a level that can go from a point close to the base plate 18 (and opposite said support surface 14) to a point close to the highest point of said deformable membrane 2, the direction of the force
30 applied being then substantially vertical and more convenient for applying by a finger or by the thumb of the consumer.

A seventh embodiment provides for the intermediate part 6, provided between said deformable membrane 2 and said cap 3, to be produced in the form of a peripheral ring 7 on which an arched element 15 taking on substantially and at least locally the form of the deformable membrane 2 in its initial state rests locally, by means of a hinge portion 9 and of which the free end 16 is produced in the form of at least one protruding or pointed element 12 directed towards the cap 3, a useful support surface 14 being provided on said arched element 15 which is capable of transmitting an external mechanical force applied on said deformable membrane 2 by the user which is sufficient to tip the protruding end element(s) 12 in order to break the cap 3 releasing an effective quantity of the substance(s) S into the contents of the receptacle R.

This solution is illustrated in figures 14 to 17.

In a particularly advantageous way, the useful support surface 14 provided on the arched element 15 has on its internal face directed towards the cap 3, a vertical or substantially vertical wall portion 17 directed towards the cap 3 of which an additional support surface 14' assists transmission of the external mechanical force applied to said deformable membrane 2 by the user to break the cap 3.

According to another characteristic, the peripheral ring 7 and the surface portion(s) 8, 8' and/or the hinge portion(s) and/or the arched element 15 are produced in a single piece, preferably by injection-moulding of a synthetic material.

Finally, if necessary, provision can also be made to equip the cap 3 provided in the capsules 1 of different embodiments of the first variant (figures 1 and 2) in addition with at least one point or line of preferential breakage, for example in the form of a pre-cut-out 5, to further facilitate the breakage of said cap 3, in combination with the aforementioned breakage means 4.

It is thus possible to provide one or more grooves where the thickness of the cap 3 has been intentionally reduced for example by laser ablation or a similar or equivalent process.

Regarding assembly of the different constituent parts of the capsule, a first solution consists of ensuring that the cap 3 is fixed directly on the deformable membrane 2, preferably in the region of their common circular periphery where said cap 3 and said deformable membrane 2 are in contact while straddling one another.

This first possibility is exemplified in figures 1, 18, 19 and 22. In the embodiment illustrated in figure 22, for example, the arched element 15 and the ring 7 are produced in a single piece in the form of a one-piece part that can be inserted freely (without welding) in the hollow formed by the deformable membrane 2 during manufacture of the capsule 1. The cap 3 is then welded directly on the corresponding peripheral portion of said deformable membrane 2, the arched element 15 being trapped therebetween without necessarily being fixed there. The manufacturing process of the capsule 1 according to this embodiment is thus advantageously simplified.

According to a second possibility, the cap 3 is fixed directly on the lower face 6' of the intermediate part 6, in particular on the lower face 6' of the periphery of the ring 7 forming said intermediate part 6, which then excludes direct contact between said cap 3 and the deformable membrane 2 (cf. figures 3 to 17, 20 and 21).

In the embodiment illustrated in figure 17, for example, the arched element 15 and the ring 7 are also produced in a single piece in the form of a one-piece part that is however fixed, for example, by welding on the cap 3, the deformable membrane 2 being itself fixed or welded on a corresponding peripheral portion of said ring 7, the arched element 15 being then trapped therebetween and fixed there.

Advantageously, the cap 3 is fixed by circular welding, circular thermal contact or by any similar process on the deformable membrane 2 or the lower face 6' of the intermediate part 6.

The present invention also relates to a stopper for a receptacle with a neck or collar for the distribution of liquids or pastes, in particular for mineral water bottles, characterised in that it basically consists of a base plate 18 designed to be fixed on said receptacle R closing said receptacle R by means of a capsule 1 according to the invention added in a sealed manner on said base plate 18, the deformable membrane 2 of said capsule 1 being itself covered by a rigid protective cover 19 resting on a ring-shaped base part 20 added on said base plate 18, the lower base of said capsule 1 being formed by the piercable cap 3, a useful sealed volume V filled with at least one substance S for adding to the contents of the receptacle R before consumption being thus defined between the deformable membrane 2 and said cap 3 of said capsule 1, an effective quantity of the substance(s) S being released into the contents of the receptacle R when the cap 3 breaks due to sufficient deformation of the deformable membrane 2.

According to a preferred variant embodiment, illustrated in figures 23 to 25, the sealed capsule 1 according to the invention is characterised in that it comprises at least one intermediate part 6 provided between said deformable membrane 2 and said cap 3, said intermediate part 6 having said at least one breakage means 4 of said deformable membrane
5 2 which can be activated when there is sufficient deformation thereof and in that the intermediate part 6 is produced in the form of a peripheral ring 7 on which rests locally, by means of a hinge portion 9, an arched element 15 taking on substantially and at least locally the form of the deformable membrane 2 in its initial state and of which the free end 16 is produced in the form of at least one projecting or pointed element 12 directed towards the
10 cap 3, a useful support surface 14 being provided on said arched element 15 that is capable of transmitting an external mechanical force applied on said deformable membrane 2 by the user that is sufficient to cause the end projecting element(s) 12 to tip in order to break the cap 3 releasing an effective quantity of the substance(s) S contained in said capsule 1.

Preferably, the deformable membrane 2 and the protective cover 19 can both be
15 produced from an elastically deformable material, substantially in the form of two hemispheres, the radius of the hemisphere of the protective cover 19 being slightly less than that of the hemisphere of the deformable membrane 2, said hemisphere of the protective cover 19 being provided with at least one meridional indentation 19' extending from the base of said hemisphere over a part of the height thereof. This embodiment of the protective
20 cover 19 is particularly advantageous since said protective cover does not need to be moulded in the open position, the size of the mould is thus considerably reduced and its resistance increased, which allows the manufacturing cost of the protective cover 19 to be substantially reduced. In addition, from the mechanical point of view, the fact of not moulding the protective cover 19 in the open position also allows the integrity of the hinge
25 35, which can be weakened during moulding in the open position, to be preserved.

Figure 23 illustrates the protective cover 19 and the base part 20 before they are fitted on the base plate 18 in the stopper and figure 24 illustrates the protective cover 19 and the base plate 18 assembled. During this assembly, the meridional indentations 19' are enlarged and diverge from each other for the fitting of said protective cover 19, in such a
30 way that its size is increased to close it on the base plate 18, in collaboration with the opening and closing means 33 and 34.

The non-limiting examples of stoppers that can be equipped with a capsule 1 according to the invention are illustrated in figures 18 to 25.

Advantageously and as can be seen for example in figures 18 and 19, the stopper according to the invention is characterised in that the base plate 18 is produced in the form of a part consisting of a cylindrical portion 21 designed to be fixed on the neck or collar G of the receptacle R equipped, in the region of its upper end, with a flat annular portion 22 forming a circular internal shoulder 23 delimiting an opening 24 of said receptacle R, the cap 3 resting or being fixed on the upper face 22' of said flat annular portion 22 turned towards the capsule 1.

The base plate 18 may be produced as a moulded part, for example by injection-moulding, and will preferably be produced from a plastic material.

The base plate 18 allows the stopper to be fixed on the receptacle R and at the same time provides the base for the deformable membrane 2 and the base part 20 of the rigid protective cover 19 covering said deformable membrane 2.

As can be seen particularly in figures 18 to 22, the stopper according to the invention is further characterised in that the lower face 22" of the flat annular portion 22 has a vertical indent 25 in the form of a ring-shaped skirt designed to collaborate with the internal face of the neck of the receptacle R and the cylindrical portion 21 in order to fix said stopper thereon. Said vertical indent 25 is also visible in figures 23 and 24 which illustrate a simplified version similar to that in figures 18 to 22 as regards this part of the stopper.

Advantageously, the stopper according to the invention (in the variant illustrated in figures 18 to 22) is further characterised in that the upper face 22' of the flat annular portion 22 is equipped with an annular rim 26 which is at least slightly deformable forming, after fitting the capsule 1 in said stopper, an annular throat 27 with said flat annular portion 22 trapping the peripheral part of the capsule 1, in the region of the cap 3 and the deformable membrane 2 and, if applicable, the intermediate part 6.

In this way, it becomes possible to seal said deformable membrane 2 perfectly and to guarantee a better seal of the sealed volume V. Accordingly, the annular rim 26 is folded down towards the flat annular portion 22 of the base plate 18 when said deformable membrane 2 is fitted. This crimping of the deformable membrane 2 may be further

reinforced by the flat annular part 22 of the base part 20 when said base part is fitted on the base plate 18 by compression thereof as explained below.

Preferably, the stopper according to the invention is also characterised in that the cylindrical portion 21 designed to be fixed on the neck or collar G of the receptacle R has
5 on its circular external side wall means 28 designed to cooperate with additional means 29 situated on the base part 20 to fix the base part 20 on the base plate 18.

These means may all be traditional suitable mechanical fixing means.

As a non-limiting example, the means 28 and the additional means 29 are produced, as suggested diagrammatically in figures 18 to 22, by "female" elements such as notches or
10 grooves cooperating with "male" elements, such as, lugs or beads, etc.

Also advantageously, the stopper according to the invention is characterised in that the base part 20 comprises a cylindrical sleeve 30 designed to be fixed on the base plate 18 and equipped, in the region of its upper end, with a flat annular part 31 forming a circular internal rim 32 designed to come to rest, preferably compressing it, on the annular rim 26
15 which traps the peripheral part of the capsule 1, in the region of the cap 3 and the deformable membrane 2 and, if applicable, the intermediate part 6.

As explained above, this measure advantageously allows the upper seal between the deformable membrane 2 and the base plate 18 of the stopper to be further reinforced.

Alternatively, the cylindrical sleeve 30 of the base part 20 can be fixed directly, by
20 any usual means (welding, gluing, etc.) on the deformable membrane 2 of the capsule 1 that rests and/or is fixed in its turn on the base plate 18, possibly by means of the cap 3. Thus, said cylindrical sleeve 30 may come to a mechanical stop when the protective cover 19 is assembled with the base plate 18 and be fixed in the region of this end stop and/or laterally in the region of the cylindrical periphery of said base plate (cf. figure 24).

25 The stopper according to the invention may be fixed on the neck of the receptacle R by any usual means. Preferably, said stopper is screwed on the neck of said receptacle R.

In the latter case, provision can be made as illustrated in figures 18 to 24, for the cylindrical part 21 to be produced in the form of a cylindrical sleeve equipped with an internal thread 21' designed for screwing on the external thread of the threaded neck or
30 collar G of the receptacle R.

Thus, the stopper according to the present invention may be fitted on any receptacle equipped with a standard thread.

According to another characteristic, the base part 20 has a first opening and closing means 33 designed to cooperate by engagement by elastic deformation with a second corresponding means 34 situated on the protective cover 19.

5 In general, any male-female-type device or similar can be adapted to the present stopper to guarantee reliable and easily unlockable closure of the protective cover 19.

According to a first variant, the base part 20 has a push button equipped with a first hook designed to cooperate with a second corresponding hook situated on the protective cover 19.

10 Thus, it is enough to press, for example using the thumb, on said push button for the aforementioned hooks to come undone, which causes said protective cover 19 to open and gives access to the deformable membrane 2.

According to another variant, the base part 20 has a push button equipped with a recess designed to cooperate with a corresponding lug situated on the protective cover 19.

15 To allow the protective cover 19 to pivot during opening and the pivoted part to be held provision is advantageously made for the protective cover 19 to be connected to the base part 20 by at least one cover hinge 35. This hinge 35 may be produced in different forms. In figures 18 to 22, for example, said hinge 35 is produced in the form of a simple element injected in a synthetic material connecting the base of the protective cover 19 to the base part 20.

20 The hinge 35 illustrated in figure 25 connecting the protective cover 19 in the region of its highest point to the base part 20 is produced according to a particular method that allows said cover to be articulated or pivoted in the region of the highest point of its constituent hemisphere. This embodiment of the protective cover 19 and the hinge 35 allows the protective cover 19 to be positioned on the base part 20 in order to "crush it" 25 against said base part 20, this crushing causing the meridional indentations 19' to spread and the opening and closing means 33 and 34 to engage, as illustrated in figure 25. When said opening and closing means are engaged with each other, the closed position of the protective cover 19 on the base part 20 is stabilised.

30 Alternatively provision can be made for the cover 19 not to be fixed permanently to the base part 20 but for it to only rest thereon (for example being engaged there by elastic deformation) and for it to be finally removed during use or consumption of the contents of the receptacle R. In fact, the protective cover 19 is designed primarily to protect the

deformable membrane 2 from any unwanted outside aggression, for example during handling, storage and transport of the stoppered receptacles R which could accidentally deform or damage it and break the seal of the volume V.

5 In a particularly simple and economical embodiment, the protective cover 19 is produced in a single piece with the base part 20.

According to another characteristic, the lower end of the base plate 18 at a distance from the outlet of the neck or collar G of the receptacle R is equipped with a security ring 36.

10 It ensures that the stopper has never been unscrewed from the neck or collar of the receptacle R.

In addition, the stopper according to the invention is further characterised in that it also comprises at least one anti-tamper device in the region of a means participating in the locking of the protective cover 19 in the closed position.

15 Such a means can for example be produced in the form of a ring or circular band of foil in a thermoformed thermoplastic material that takes on the form and covers, before the first use, said locking means of the protection cover. This band is pulled off during the first use, for example, using a means to facilitate this removal such as a pre-cut-out portion (in perforated lines), a pulling notch, an opening thread, etc. and thus serves as evidence of the opening of the stopper in question.

20 According to another advantageous characteristic, the protective cover 19 and the deformable membrane 2 are produced from one or more translucent, preferably transparent, materials.

25 Thus, the user can check the presence of the substance S before use, for example the presence of a tablet such as a particular medicament that must be dissolved in the contents of the receptacle R before ingestion. If transparent materials are used, it also allows the nature of the substance S to be controlled, for example by means of a colour code or shape. It is thus possible to imagine a substance S coloured according to the nature of its taste which can be added to a drink with no or relatively little taste or a taste that needs to be modified, by being intensified or on the other hand reduced or even masked.

30 As a non-limiting example, the substance S may be a coloured powder, pastille or syrup to be dissolved in mineral water, each colour corresponding to a flavour or other pre-

defined characteristic (yellow = lemon, red = apple, green = lime, orange = mandarin or orange, brown = chocolate, blue = menthol, black = cola, etc.).

Finally, producing [the stopper] in a transparent material also enables the aesthetic and playful aspect to be increased.

5 More generally, the substance(s) S may be any kind of food or non-food substance (in whatever state – solid, liquid, gaseous, paste-like, etc.) or mixture of substances that may be wished to be added to the contents of the receptacle R, it being also possible for said contents to be any kind of food or non-food, also regardless of its physical state.

10 Preferably, the substance(s) S are solids or liquids and the contents of the receptacle R is a more or less viscous liquid, preferably water and still more preferably mineral water.

Preferably, the substance(s) and the contents of the receptacle R are food, in other words not toxic to people or animals.

15 Although the non-limiting example of the present exposition is given for a solid substance S and a liquid contents of the receptacle R, it goes without saying that a person skilled in the art will know how to adapt it to other cases not explicitly described here, by providing arrangements for use regarding the nature of the materials employed, the dimensions of the different parts, etc.

20 The term “added” concerning said substance(s) is also understood to include addition pure and simple, in other words the simple fact of adding said substance(s) S (for example insoluble) to the contents of the receptacle R, but also their physical mixing (assisted or not) to form a stable mixture, suspension, emulsion, etc. therefrom, their partial or complete dissolving in said contents, and their chemical mixing (causing one or more chemical reactions).

25 Advantageously, the substance(s) S comprise(s) at least one substance which is sensitive to the contents of the receptacle R with which the capsule 1 is intended to collaborate and that must only be added thereto a very short time or just before its consumption.

30 Non-limiting examples of such a substance S are medical preparations in which the active compound is very fragile and must be put in administrable form at the last minute, mixtures that have little physical or chemical stability over time (non-miscible substances, perishable goods), etc.

Thus, according to another characteristic, the capsule 1 according to the invention is characterised in that the substance(s) S comprise(s) at least one medicament.

According to another characteristic, the capsule 1 according to the invention is characterised in that the substance(s) S comprise(s) at least one drinkable cosmetic agent,
5 for example a drinkable solution of collagen.

As mentioned earlier, the substance(s) S are preferably food substances.

Advantageously, the substance(s) S are selected from the group made up of colorants, flavours, preservatives, sweeteners, thickeners, stabilisers, nutraceuticals, nutritional or dietetic supplements or any composition obtained from at least two of these
10 ingredients.

Nutraceutical is understood to be any foodstuff considered particularly beneficial to health (milky, cereal-based products, fibres, etc.).

Finally, the capsule 1 according to the invention is further characterised in that the substance or substances S comprise at least one solid substance, possibly reduced in the
15 form or powder or granules.

As illustrated in figures 1 to 4, the capsule 1, and indeed the stopper equipped with such a capsule 1, has a substantially rounded hemispherical external form, perhaps slightly flattened.

Because of these ergonomic rounded shapes, handling receptacles thus stoppered
20 (holding, transport, etc.) and their aesthetic appearance are reinforced and the risk of injury, particularly to children, is reduced.

According to a particularly interesting variant, in particular for a capsule 1 according to the first embodiment (figures 1 and 2) to which it is particularly well suited, the circular internal shoulder 23 delimiting an opening 24 of said stoppered receptacle R is
25 provided on part of its internal periphery with at least one tooth-shaped element 37, designed to facilitate breakage of the piercable cap 3 when the deformable membrane 2 of the capsule 1 is sufficiently deformed (cf. figure 18).

Alternatively, provision can be made for this type of capsule 1, for the vertical annular indent 25 (of the base plate 18) to be provided with a pair of parallel arms 38, 38'
30 extending in a plane parallel to the surface of the cap 3 and originating on the internal periphery of said vertical indent 25 at diametrically opposed points 39, 39', said arms 38, 38' being preferably connected to each other by a pontoon 40 passing through the centre of

the opening 24, said arms 38, 38" each having, in the region of their ends, at least one projecting element in the form of a point 41, 41' or similar directed towards the surface of the cap 3 and designed to facilitate breakage of said piercable cap 3 when the deformable membrane 2 of the capsule 1 is sufficiently deformed.

5 This particular embodiment is illustrated in figures 26 to 29, which have been simplified for greater clarity compared with figures 18 to 21.

When the part in question is being manufactured by injection-moulding, the pontoon 40 can be used as an injection-moulding place I for the plastic material (cf. fig. 29).

10 When the deformable membrane 2 is deformed sufficiently, with or without the assistance in particular of the substance(s) S contained in the sealed volume V of the capsule 1, the cap 3 which is situated above and at a sufficiently safe distance from the points 41, 41' (to avoid any accidental breakage) is pushed downwards in the direction thereof which pierce it through or cause the beginning of breakage along a pre-existing
15 preferential breakage point or line, so as to release a sufficient quantity of the substance(s) S into said receptacle R.

Finally, the present invention also relates to a receptacle R with a neck or collar for the distribution of liquids or pastes, in particular mineral water, characterised in that it comprises a capsule 1 according to the present invention.

20 Advantageously, said receptacle R is characterised in that said capsule 1 is fitted in a stopper according to the present invention.

To pour or drink directly from the neck or collar G of the receptacle R the mixture resulting from the mixing of the substance(s) S with the contents of the receptacle R, the stopper need only be unscrewed completely to allow said mixture to pass through the
25 opening 24 of the receptacle R. This embodiment is economical because it does not need the addition of a part to pour the mixture. In addition, the stopper can be screwed or unscrewed at will without altering the seal of the receptacle R, which also allows said mixture to be kept in the receptacle R, while guaranteeing protection from the outside, since the deformable membrane 2 is impermeable, after it has been deformed. Provision can also
30 be made for an element such as a valve in the region of the base plate 18 to allow the discharge of gases that may have formed when the substance S was mixed with the content

of the receptacle R accumulating in the receptacle R (for example CO₂ for effervescent tablets), and thus avoid the risk of over-pressure.

5 An access or second stopper may also be provided on the lateral surface of the receptacle R to allow said mixture to be dispensed. This access or second stopper may also have a de-gassing means. This variant embodiment is more complicated to implement, and therefore more expensive. Moreover, it requires the addition of a part, which breaks the symmetry of the receptacle R and complicates its storage and handling.

10 Of course, the invention is not limited to the embodiments described and illustrated in the accompanying drawings. Modifications are possible, particularly from the point of view of the structure of the various elements or by substituting technical equivalents, without thereby departing from the scope of protection of the invention.